IN THE CLAIMS

1. (Previously Amended) A lithographic projection apparatus comprising:

an illumination system to supply a projection beam of radiation;

a first object table to hold a projection beam patterning structure capable of patterning the projection beam according to a desired pattern;

a second object table to hold a substrate having a surface to be exposed, such that, when held on the table, the said surface lies in a reference plane;

a projection system which images the patterned beam onto a target portion of the substrate;

a positioning system which moves said second object table between an exposure position, at which said projection system can image said patterned beam onto said substrate, and a measurement position; and

a calibration system to measure lateral displacements of a reference point in a plane of said second object table as a function of tilt, at said measurement position, wherein said calibration system comprises:

a diffraction grating mounted to said second object table;

an illuminator which generates a measurement beam of radiation and directs it to be incident on said diffraction grating so as to be diffracted thereby; and

a detector which detects the position of said diffraction grating.

2. (Previously Amended) Apparatus according to claim 1 wherein said diffraction grating is an at least partially transmissive diffraction grating and said calibration system further comprises a light guide which directs said measurement beam to be incident on said diffraction grating in a direction substantially independent of the tilt of said second object table.

3. (Previously Amended) Apparatus according to claim 1, wherein said calibration system is constructed and arranged to measure displacements of a reference point in said reference plane and said diffraction grating is mounted substantially parallel to said reference plane on said second object table.

4. (Previously Amended) Apparatus according to claim 2, wherein said illuminating means is arranged to emit said measurement beam along an incident path substantially perpendicular to and spaced from said diffraction grating, and said light guide comprises a plurality of reflectors mounted to said second object table behind said diffraction grating relative to said illuminator and positioned to reflect said measurement beam onto a return path parallel to said incident path and passing through said diffraction grating in a direction opposite to said incident path.

5. (Original) Apparatus according to claim 4, wherein said plurality of reflectors comprises a transparent body having three mutually perpendicular faces at which said measurement beam undergoes reflection.

6. (Previously Amended) Apparatus according to claim 1, wherein said illuminator is arranged to emit said measurement beam along an incident path substantially perpendicular to said diffraction grating and passing therethrough, and comprising a light guide including a retro-reflector mounted to said second object table behind said diffraction grating relative to said illuminator to reflect said measurement beam along a return path substantially parallel to said incident path and passing back through said diffraction grating.

7. (Original) Apparatus according to claim 6, wherein said retro-reflector comprises a plane-reflector and a condensing lens mounted at a distance substantially equal to its focal length from said plane-reflector.

8. (Original) Apparatus according to claim 7, wherein said retro-reflector comprises a solid body of transparent material having a front surface curved to form said condensing lens and a plane rear surface partly reflective to form said plane-reflector.

9. (Previously Amended) Apparatus according to claim 7, wherein said plane-reflector is sized and positioned so as to reflect substantially only the zeroth diffraction order of the measurement beam diffracted by its first passage through said diffraction grating.

10. (Original) Apparatus according to claim 9, further comprising absorbent or diffusive surfaces in the plane of said plane-reflector outside the reflecting area thereof.

11. (Original) Apparatus according to claim 6, wherein said retro-reflector comprises a corner-cube.

12. (Previously Amended) Apparatus according to claim 6 further comprising an anti-reflection coating on at least one surface of said diffraction grating.

13. (Previously Amended) Apparatus according to claim 1 comprising a plurality of calibration systems for measuring displacements of said second object table with tilt about a plurality of axes.

14. (Previously Amended) A method of calibrating a lithographic projection apparatus comprising:

measuring a position of a reference point on a surface of an object table for holding a substrate having a surface to be exposed at different tilts;

calculating a distance between the surface of the object table and a rotation-invariant point of the object table; and

adjusting parameters of an electronic controller included in a positioning system for moving said object table between an exposure position and a measurement position so that said rotation-invariant point is at a predetermined vertical distance from the reference point of the object table.

15. (Previously Amended) A method of manufacturing a device using a lithographic projection apparatus comprising:

providing a substrate provided with a radiation-sensitive layer and having target portions thereof to an object table;

providing a projection beam of radiation using an illumination system;

using a projection beam patterning structure to endow the projection beam with a pattern in its cross section;

moving the object table to an exposure position;

projecting the patterned beam of radiation onto said target portions of the substrate; and

detecting displacements of a reference point of said object table at various angles of tilt when situated at a measurement position.

16. (Previously Amended) A device manufactured according to the method of claim 15.

17. (Previously Added) An apparatus according to claim 14, wherein measuring of the position of the reference point on the surface of the object table comprises directing a measurement beam to be incident on a diffraction grating, provided on the object table, substantially independent of the tilt of the object table and detecting the position of said diffraction grating.

18. (Previously Added) An apparatus according to claim 14, wherein measuring of the position of the reference point on the surface of the object table comprises directing a measurement beam along an incident path substantially perpendicular to a diffraction grating provided on the object table, and reflecting said measurement beam along a return path substantially parallel to the incident path and passing through said diffraction grating in a direction opposite to the incident path.

19. (Previously Added) An apparatus according to claim 15, wherein detecting displacements of the reference point of said object table comprises directing a measurement beam to be incident on a diffraction grating, provided on said object table, substantially independent of the tilt of said object table and detecting the position of said diffraction grating.

20. (Previously Added) An apparatus according to claim 15, wherein detecting displacements of the reference point of said object table comprises directing a measurement beam along an incident path substantially perpendicular to a diffraction grating provided on said object table, and reflecting said measurement beam along a return path substantially parallel to the incident path and passing through said diffraction grating in a direction opposite to the incident path.